



Standard Practice for Evaluating Stress-Corrosion-Cracking Resistance of Metals and Alloys in a Boiling Magnesium Chloride Solution¹

This standard is issued under the fixed designation G36; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice describes a procedure for conducting stress-corrosion cracking tests in a boiling magnesium chloride solution. Although this test may be performed using various concentrations of magnesium chloride, this procedure covers a test solution held at a constant boiling temperature of $155.0 \pm 1.0^\circ\text{C}$ ($311.0 \pm 1.8^\circ\text{F}$). The boiling points of aqueous magnesium chloride solutions at one atmosphere pressure as a function of concentration are shown graphically in Fig. 1.² A suggested test apparatus capable of maintaining solution concentration and temperature within the prescribed limits for extended periods of time is also described herein.³

1.2 The boiling magnesium chloride test is applicable to wrought, cast, and welded stainless steels and related alloys. It is a method for detecting the effects of composition, heat treatment, surface finish, microstructure, and stress on the susceptibility of these materials to chloride stress corrosion cracking.⁴

1.3 This practice is concerned primarily with the test solution, which may be used with a variety of stress corrosion test specimens, surface finishes, and methods of applying stress.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appro-*

priate safety and health practices and determine the applicability of regulatory limitations prior to use. See Section 7 for specific safety precautions.

2. Referenced Documents

2.1 *ASTM Standards:*⁵

D1193 Specification for Reagent Water

G1 Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens

G15 Terminology Relating to Corrosion and Corrosion Testing (Withdrawn 2010)⁶

G30 Practice for Making and Using U-Bend Stress-Corrosion Test Specimens

3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice see Terminology G15.

4. Summary of Practice

4.1 A predetermined quantity of reagent grade magnesium chloride and some distilled water are added to a container. The container and contents, with thermometer and condenser affixed, are placed on a source of heat. When the magnesium chloride solution boils, it is adjusted to maintain the desired concentration and boiling point through the addition of small quantities of either water or salt.

4.2 After the solution has stabilized at the desired boiling point for the test, the stressed specimens are added. Depending upon the intent of the test, the specimens should be given periodic inspections. If the duration of test exceeds 7 days, the solution should either be changed or the suggested or similar test apparatus used.

5. Significance and Use

5.1 For most applications, this environment provides an accelerated method of ranking the relative degree of stress-corrosion cracking susceptibility for stainless steels and related

¹ This practice is under the jurisdiction of ASTM Committee G01 on Corrosion of Metals and is the direct responsibility of Subcommittee G01.06 on Environmentally Assisted Cracking.

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² Available data on the relationship of concentrations and boiling points of magnesium chloride solutions are critically reviewed and supplemented by I. B. Casale in “Boiling Points of Magnesium Chloride Solutions—Their Application in Stress Corrosion Studies,” *Corrosion*, Vol 23, 1967, pp. 314–17.

³ The apparatus and test procedures for maintaining constant boiling temperatures of magnesium chloride solutions for stress corrosion tests are described by M. A. Streicher and A. J. Sweet in *Corrosion*, Vol 25, 1969, pp. 1–6.

⁴ The use of concentrated magnesium chloride solutions for determining the susceptibility to stress corrosion cracking of austenitic and ferritic stainless steels and related nickel-base alloys was first described by M. A. Scheil, *Symposium on Stress Corrosion Cracking of Metals*, ASTM STP 64, ASTM, 1945, p. 395. (Although currently out of print, copies may be obtained from University Microfilms, Inc., 300 North Zeeb Rd., Ann Arbor, MI 48106.)

⁵ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

⁶ The last approved version of this historical standard is referenced on www.astm.org.